

# Section 3 Introduction

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# 3

## Introduction

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### 3.1 Background

**P**lanning for the use of Utah's water resources has always been a part of the state's history. Specific legislation to direct state water planning was passed in 1963. The first 19 sections of the *State Water Plan*<sup>16</sup> provide the basis for the future of Utah's water resources. Section 20 is comprised of summaries of individual basin plans. These plans provide more detail on available resources. They also detail problems, needs and demands for the resources and alternatives for future actions. Final decisions in the alternative selection process should be made at the local level. Section 21 contains the annual status reports; they show major changes and progress made on resolving issues.

### 3.2 Planning Guidelines

The basic foundation for state water planning is described in detail in the *State Water Plan*. Guidelines in the plan help preserve continuity during basin planning and insure the individual plans are complementary to the state plan and to each other.

**The *State Water Plan* covers all aspects of Utah's water resources. The plan is designed to be flexible, to change as future conditions require. It describes a process for planning, investigating, conserving and developing the water resources.**

#### 3.2.1 Principles

Many values, uses and interests are involved in preparing a basin plan. Certain guiding principles should also be considered. These are:

1. All waters, whether above or below ground, are held in trust by the state as public property; their use is subject to rights administered by the State Engineer. Surface water and groundwater rights are governed under a common body of Utah statutes. The doctrine of prior appropriation, which has governed Utah water law since statehood, will continue to be used.

2. Water is essential to life. Future generations are entitled to ample, good quality water to meet their basic needs.

3. The diverse present and future interests of Utah's residents should be

protected through a balance of economic, social, aesthetic and ecological values.

4. Water uses that are difficult to identify and charge beneficiaries for, such as recreation and aesthetic, should be included in program evaluation.

5. Public input is vital to water resources planning.

6. All residents of the state are encouraged to exercise water conservation and implement wise use practices.

7. Water right owners are entitled to transfer their rights to others under free market conditions. The State Engineer should be informed of any transfers in order to keep records current.

8. Water resources projects should be technically, economically and environmentally sound.

9. Water planning and management activities of local, state and federal agencies should be coordinated.

10. Local governments, with state assistance as is appropriate, are responsible for protecting against emergency events such as floods and droughts.

11. Water quality should be improved or maintained unless there is evidence the loss of water quality is outweighed by other benefits. State water quality standards should not be violated and the designated uses should be maintained and protected.

12. Educating Utahns about water is essential. Effective planning and management requires a broad-based citizen understanding of water's physical characteristics, potential uses and scarcity values.

### **3.2.2 Purpose**

One main purpose of this basin plan is to identify issues and describe future alternatives and possible development to provide for the water needs of future generations. Irreversible commitments could

be very costly and prevent the fulfillment of future needs. Coordinated planning can be the vehicle to involve concerned parties.

### **3.2.3 Organization**

State water planning is the responsibility of the Division of Water Resources under the auspices of the Board of Water Resources. Several other state agencies with major water-related missions are also involved in the water planning process. As a result, a state water plan coordinating committee was formed with representation from 12 state agencies. A steering committee provides policy, resolves issues and approves plans prior to acceptance by the Board of Water Resources. In addition, 19 state and federal agencies are participating as cooperating agencies. They have particular expertise in various fields to assist with plan development.

A statewide local advisory group has assisted with input to various aspects of planning and with plan review. This group represents various interests and geographic locations.

The membership on the steering committee, coordinating committee, the cooperating state and federal agencies and the statewide local advisory group are listed in Section 3.4 of the *State Water Plan*.<sup>16</sup> One change has been made to that list. The Utah Division of Comprehensive Emergency Management is now a member of the coordinating committee; it was listed as a cooperating state agency.

A local basin planning advisory group provides input by way of advice, review and decision-making. The group represents various local interests and provides geographical representation within the basin.

### 3.2.4 Process

During the review and approval process, four drafts of the Kanab Creek/Virgin River Basin Plan are prepared. These are: 1) In-House Review Draft, 2) Committee Review Draft, 3) Advisory Review Draft and 4) Public Review Draft. Revised drafts can occur at any point, if warranted. After this process, the final basin plan is distributed to the public. Although the final plan provides guidance for water use, conservation, preservation and development for state and federal agencies, it is primarily for local entities.

### 3.3 Basin Description

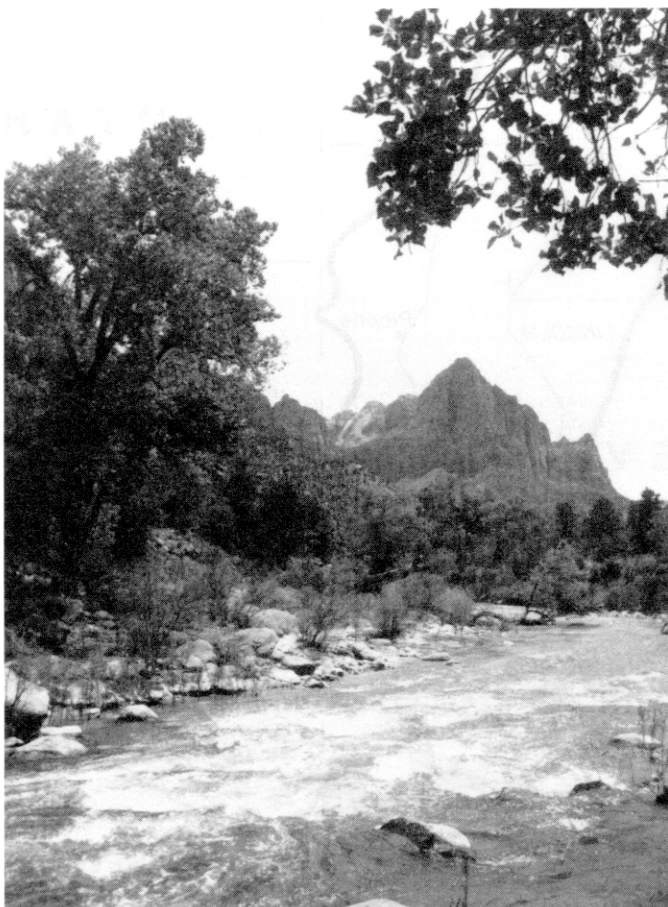
The Kanab Creek/Virgin River Basin is shown in Figure 3-1 and Figure 3-2. This basin plan includes the Utah part of the Virgin River and its tributaries and Kanab Creek and Johnson Wash. This area is a part of the Lower Colorado River Basin, which includes everything below Lee Ferry.

Johnson Wash discharges into Kanab Creek which discharges directly into the Colorado River in Arizona. Some Fort Pierce Wash tributaries originate in Utah, but most of the drainage is in Arizona. Fort Pierce Wash empties into the Virgin River just below St. George. Beaver Dam Wash originates in Utah, flows through Nevada and back into Utah and enters the Virgin River near Littlefield, Arizona. The Virgin River eventually empties into Lake Mead.

The Kanab Creek/Virgin River Basin, Utah, is bounded on the north by the Bull Valley Mountains, Harmony Mountains, Markagunt Plateau (Navajo Lake area) and the Paunsaugunt Plateau (Bryce Canyon area).

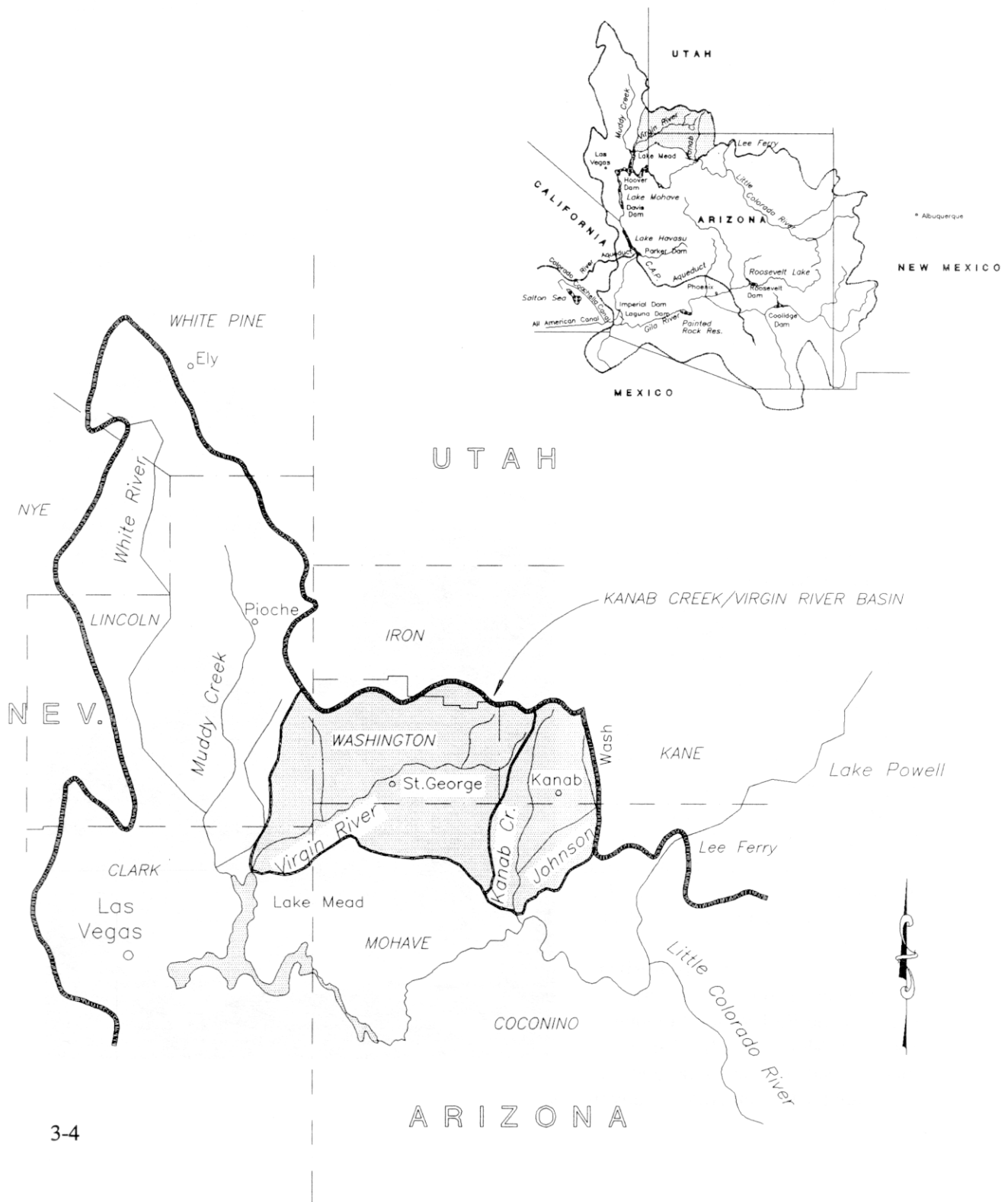
The east boundary is Timber Mountain and the eastern hydrologic boundary of Johnson Wash. The southern and western boundaries are the Utah-Arizona and Utah-Nevada state lines, respectively.

Elevations vary from a high of 10,375 feet at Black Mountain in the Cedar Mountains and 10,365 feet at Signal Peak in the Pine Valley Mountains to 2,297 feet and 2,461 feet where the Beaver Dam Wash and Virgin River, respectively, cross the state line. In the eastern part of the basin, elevations range from 9,394 feet near Bryce Canyon National Park to 4,922 feet and 5,086 where Kanab Creek and Johnson

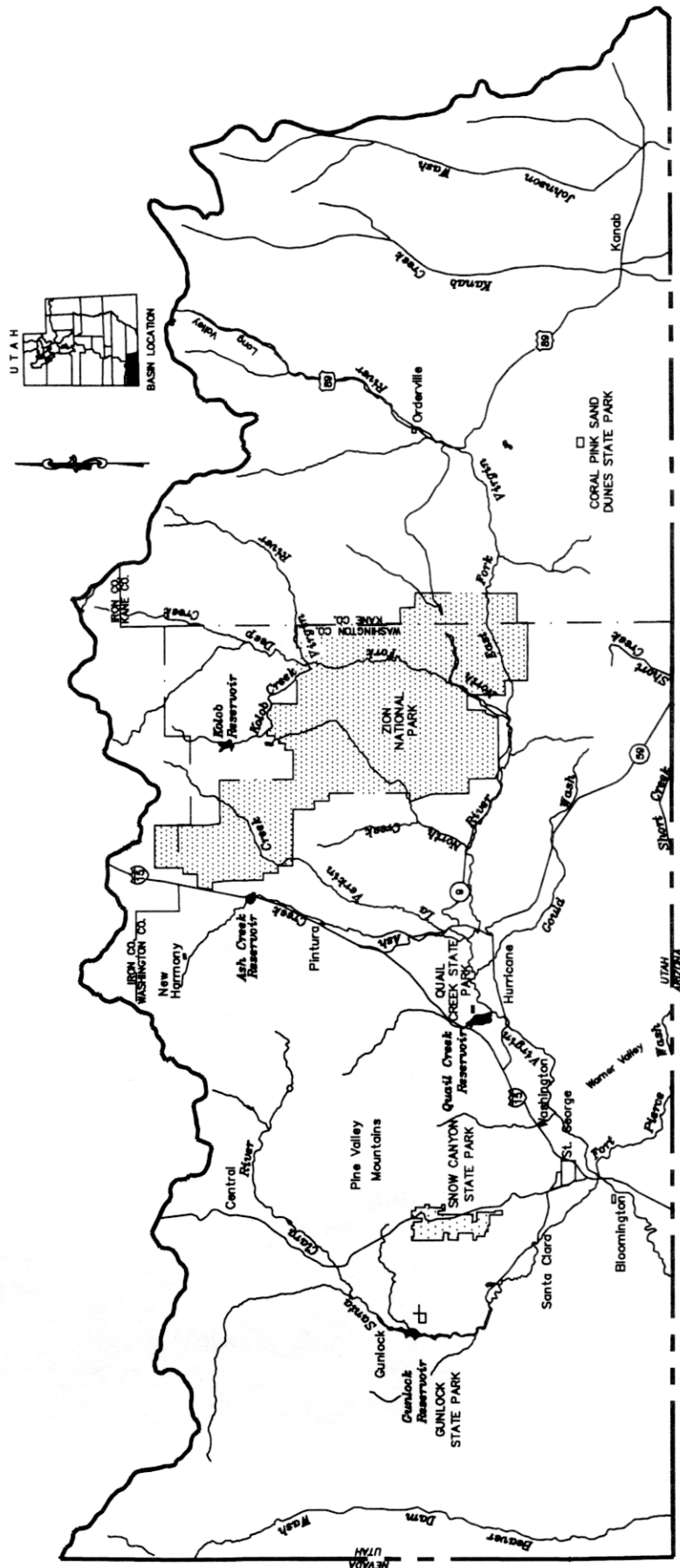




**FIGURE 3-1**  
**Regional Location Map**  
**Kanab Creek/Virgin River Basin**



**FIGURE 3-2**  
**Location Map**  
**Kanab Creek/Virgin River Basin**



Wash, respectively, cross the state line.

Generally, only the hydrologic drainages within Utah are discussed in this report. In some instances, areas in Nevada and Arizona are discussed for clarity.

The basin includes most of Washington County and parts of Kane and Iron counties. The major population centers are St. George and Washington cities in Washington County and Kanab in Kane County.

### **3.3.1 History and Settlement<sup>5,8</sup>**

The history and settlement of the Kanab Creek/Virgin River Basin provides an interesting backdrop for existing conditions. It can help explain some of the present problems as well as existing socioeconomic situations.

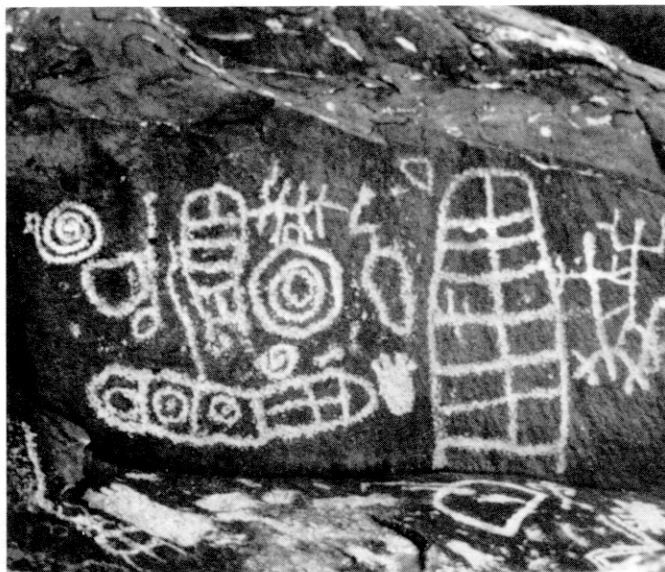
**Prehistory** - Evidence indicates the area was inhabited 8,000 to 9,000 years ago by the Paleoindian complex of big-game hunters. Most of their artifacts have been destroyed over the years by the ravages of nature. At the end of the Pleistocene ice age, most of the big game animals disappeared. The Paleoindians had to find another way of survival, so they became mobile hunters and gathers known as the Archaic people.

The Archaic people wandered over the southwest for about 6,000 years in search of food. Their principal weapon was the dart-thrower or atlatl (a throwing stick). They made baskets and sandals from yucca and other fibers, and used rabbit skin and yucca fiber blankets to keep warm in their temporary shelters. Another slight climatic change about 2,000 years ago brought the emergence of people who lived in pithouses, grouped into small villages. They made beautiful baskets - hence the name Basketmakers.

These people, probably the descendants of the Archaic people, are usually credited with the introduction of horticulture, hunting and gathering, the bow and arrow and crude pottery.

Over the next 900 years, the people gradually evolved into what today are called the Anasazi - the "Ancient Ones." These people were superb pottery makers, built large pueblos found all over the southwest and practiced sophisticated religions. They were excellent agriculturists, using every type of water control device to bring water to their fields where they grew corn, beans and squash.

The Anasazi in the Virgin River Basin evolved approximately 800 years ago. They abandoned this region and moved to areas like Black Mesa, Chaco Canyon, Hopi Mesas and along the Rio Grande River where their descendants live today. Some archaeologists attribute the move to a shift in rain patterns; others say it was continual warfare with the Uto-Aztecan speaking



groups from the west, and others claim it was a combination of both.

In the Kane County area, the Basketmakers were followed by the Puebloans. The Puebloans may be the same culture or related to the Anasazi. Early settlers in Kane County found the Kaibabits (Kaibab band of Paiutes) cultivating crops in the Kanab area and Johnson Wash.

The Uto-Aztecan hunters and gathers dominated the region for about 800 years. In this area they are called southern Paiutes. The Paiutes are noted for their basketry and well-made projectile points. Contact with Europeans spelled the end for the Paiutes. Those not killed by introduced diseases saw their farmlands and hunting and gathering areas gradually taken by the white man. The entire process took about 100 years and finally ended with the Paiutes being moved onto reservations around the turn of the century.

**History** - The first white man to pass through the area is believed to be Garcia Lopez de Cardenas, a lieutenant of the

Spanish explorer Coronado, in about 1550. A party of eight, headed by Father Silvestre Valez de Escalante and Father Francisco Atanasio Dominques, two Franciscan monks, passed through the area in October 1776 trying to find a route from Santa Fe, New Mexico, to Monterey, California. Near Harrisburg, Washington County, they turned to the south and east, their mission a failure.

Fifty years later in 1826, Jedediah Strong Smith descended Ash Creek and the Virgin River enroute to California looking for new beaver country. It is possible Ewing Young, William Wolfskill, J.J. Warner and others followed Smith's route down the Virgin River toward California.

By the time Captain John C. Fremont came from California in 1844 by way of the Muddy River and Virgin River, across the Beaver Dam Mountains to the Santa Clara River and on to Mountain Meadows, the "Trail" was well defined.

Jefferson Hunt made the trip in 1847 to get seed for the settlers in Salt Lake Valley. He made the trip again in 1849, leading a



party of gold-seekers. Some who left the Hunt party for a shorter route did not make it past Death Valley, hence its name. The first wagon to travel the route was brought by the Mormon Battalion in 1848.

Parley P. Pratt led a group of 50 men sent by the Mormon church to explore the Virgin River area. They camped on Red Creek near present Paragonah in December 1849. Pratt and 20 of the men camped near the mouth of the Santa Clara River in early 1850.

**Settlement** - John D. Lee led a company in February 1852 to settle Harmony. The territorial legislature created Washington County on March 3, 1852. Harmony was the county seat until 1859. Later in 1852, Lee explored Ash Creek, Quail (Otter) Creek, Washington Field and the Santa Clara River. He then went over to Beaver Dam Creek and back by way of the Narrows and Parowan. Lee, accompanied by John Steele and others, also explored the East Fork of the Virgin River in 1852.

Jacob Hamblin and five others arrived in Santa Clara (Tonagaunt Station) in 1854 to learn about the Indians. Cotton was harvested in 1855 and the area became known as "Utah's Dixie." This was to be an experiment station to test crops in the area, particularly cotton.

Heberville (now Bloomington area) was settled in 1858. This settlement (also known as Seldom Sop, Lick Skillet, Never Sweat) was abandoned because of flood problems. Most of the towns now existing in Washington County had been settled by 1867. Central, Veyo and Ivins were settled much later. The early settlements included Harmony, Santa Clara, Tonaquint, Grafton (Wheeler), Gunlock, Toquerville, Washington, Heberville, Harrisburg (Harrisville), Virgin, Pocketville, Rockville (Adventure), Duncans Retreat, Mountain Dell, St. George, Kanarraville, Northrup,

Shunesburg, Springdale, Dalton, Pintura (Ashton and Bellevue) and Leeds (Bennington). Some early settlements were later abandoned.

La Verkin and Hurricane were established at a later date. This area was recognized early as having potential fertile farmland and a good climate, but irrigation water was not easy to get for crop production. Irrigation was accomplished later after considerable effort. The first family moved to La Verkin Bench in 1889. The first people lived on Hurricane Bench in 1906, two years after the first water was delivered.

When John D. Lee first explored the Virgin River area in 1852, he found Indians diverting water from the Santa Clara River to irrigate small farms. The Indians were of the Shivwit tribe, a part of the Southern Paiutes. They were very friendly and helped the early settlers immeasurably. The United States Government gathered the Indians in 1891 to the reservation on the Santa Clara river. It was called the Jackson Farm, where 50 heads of families and a total of 194 Indians lived. The total tribal lands currently cover about 28,515 acres, primarily rangeland. About 305 acres of irrigated cropland are along the Santa Clara River within the reservation.

As stated earlier, John C. L. Smith, John Steele, John D. Lee and others explored Long Valley in what is now western Kane County. They continued down the East Fork of the Virgin River to Orderville Gulch where they had to turn back because of the precipitous terrain. In late 1858, Jacob Hamblin led a company of men from Washington County, through Kane County, and across the Colorado River to visit the Moquis Indians. A few scattered settlers were living in dugouts in the Kanab area and Long Valley. Successive trips were made in 1859 and 1860.

The Kane County boundaries were changed over the years until they were established in their present location by the territorial legislature in 1864. County seats included Grafton, Rockville and Toquerville. Kanab was named county seat in 1882.

Glendale (Berryville) and Mt. Carmel (Windsor) were settled in 1864. Some scattered settlers were in Long Valley (Berry Valley) in the 1860s. An advance contingent from the Muddy River settlement in Nevada arrived there in late 1870.

Others followed in early 1871. Orderville was settled in 1875 by part of the Mt. Carmel settlers to avoid contention in the United Order. Alton (an offspring of Upper Kanab) was settled in 1865.

Construction on Fort Kanab began during the winter of 1865-66. Kanab was permanently settled in 1870. Other settlements on the Kanab Creek drainage included Sink Valley, Skutumpah, Roundy's Station and Upper Kanab. These have since been abandoned.

Johnson, on Johnson Creek, was settled in 1871. The population eventually dwindled to a few ranching operations, but it is now increasing.

Pipe Springs (1863), Moccasin (about 1863) and Fredonia (1885) in Arizona have impacted the settlement and development around Kanab. They are in the Arizona Strip, a large area in northern Arizona and southern Utah, isolated by the Grand Canyon and Colorado River on the south and the cliffs of the Virgin River on the north.

### 3.3.2 Climate<sup>7,11,15,17,18</sup>

The climate of the Kanab Creek-Virgin River Basin varies from cold winters and short summers in the higher elevations to long, hot summers and mild winters in the lower basin areas. The valley temperature and precipitation are measured daily at eight climatological stations (Figure 3-3). Nine

snow courses are in and near the basin. Eight of these are equipped with telemetry systems so data can be made available as often as needed (Figure 3-3).

A 30-year base period (1931-1960) is used in this report to analyze the climatic factors. The snow course data is taken from Soil Conservation Service snow course data for the period 1961-1990.



**Temperature** - Mean annual temperature varies from 61°F at St. George to 45°F at Alton. Average January temperatures range from 39°F at St. George to 26°F at Alton. July temperatures are 84°F and 66°F in the two communities. Temperatures at higher and lower elevations, where there are no stations, are likely to exceed these values.

**Precipitation** - The area has two separate precipitation seasons. The first is during winter and early spring when Pacific

storms move through the region more frequently than at other periods. A secondary precipitation maximum occurs in late summer when the area is occasionally subjected to thunderstorm activity associated with moist air moving in from the subtropics.

Mean annual precipitation at the valley stations varies from 17.3 inches at New Harmony to 8.0 inches at St. George. Basinwide precipitation varies from six inches on the lower desert to 35 inches in the high mountains near Navajo Lake. The monthly mean precipitation for the basin varies from 1.77 inches in January to 0.49 inches in June. The annual precipitation is shown in Figure 3-3. The October-April and May-September precipitation is shown in Figures 3-4 and 3-5, respectively.

Snow course records show accumulated water content collected during the winter months. Most stations can be accessed to determine daily, monthly or even single storm accumulations. The April 1st forecast is the water supply indicator for the coming season. This is based on the snow course soil moisture levels, snow pack water content and other factors. Snow course locations are shown on Figure 3-3. Most of the snow courses are outside the hydrologic boundary of the basin, but they are used to predict the annual water supply.

Six distinct climatic zones<sup>10,17</sup> are recognized in the Kanab Creek/Virgin River Basin area. The zones differ from each other in the amount of moisture received, temperature and the length of growing season.

The six zones are described below and shown on Figure 3-6.

1. High Mountain Climatic Zone - The average precipitation ranges from 22 to 35 inches, the average annual temperature is 35° to 45° F., the average freeze-free period

is 40 to 90 days and elevations range from 8,000 to over 10,000 feet.

2. Mountain Climatic Zone - The average annual precipitation ranges from 16 to 22 inches, the average annual temperature is 42° to 50° F., the average freeze-free period is 70 to 170 days and elevations range from 6,000 to 8,200 feet.

3. Upland Climatic Zone - The average annual precipitation ranges from 12 to 16 inches, the average annual temperature is 45° to 59° F., the average freeze-free period is 120 to 170 days and elevations range from 4,500 to 6,900 feet.

4. Semidesert Climatic Zone - The average precipitation ranges from eight to 12 inches, the average annual temperature is 52° to 59° F., the average freeze-free period is 120 to 190 days and elevations range from 4,000 to 6,300 feet.

5. Semidesert (D 30) Climatic Zone - The average annual precipitation ranges from eight to 10 inches. The average annual temperature is 59 to 64 degrees. The average freeze-free period is 175 to 200 days and elevations range from 3,000 to 4,500 feet.

6. Desert (D 30) Climate Zone - The average annual precipitation ranges from six to eight inches, the average annual temperature is 59° to 67° F., the average freeze-free period is 175 to 205 days and elevations range from 2,400 to 4,000 feet.

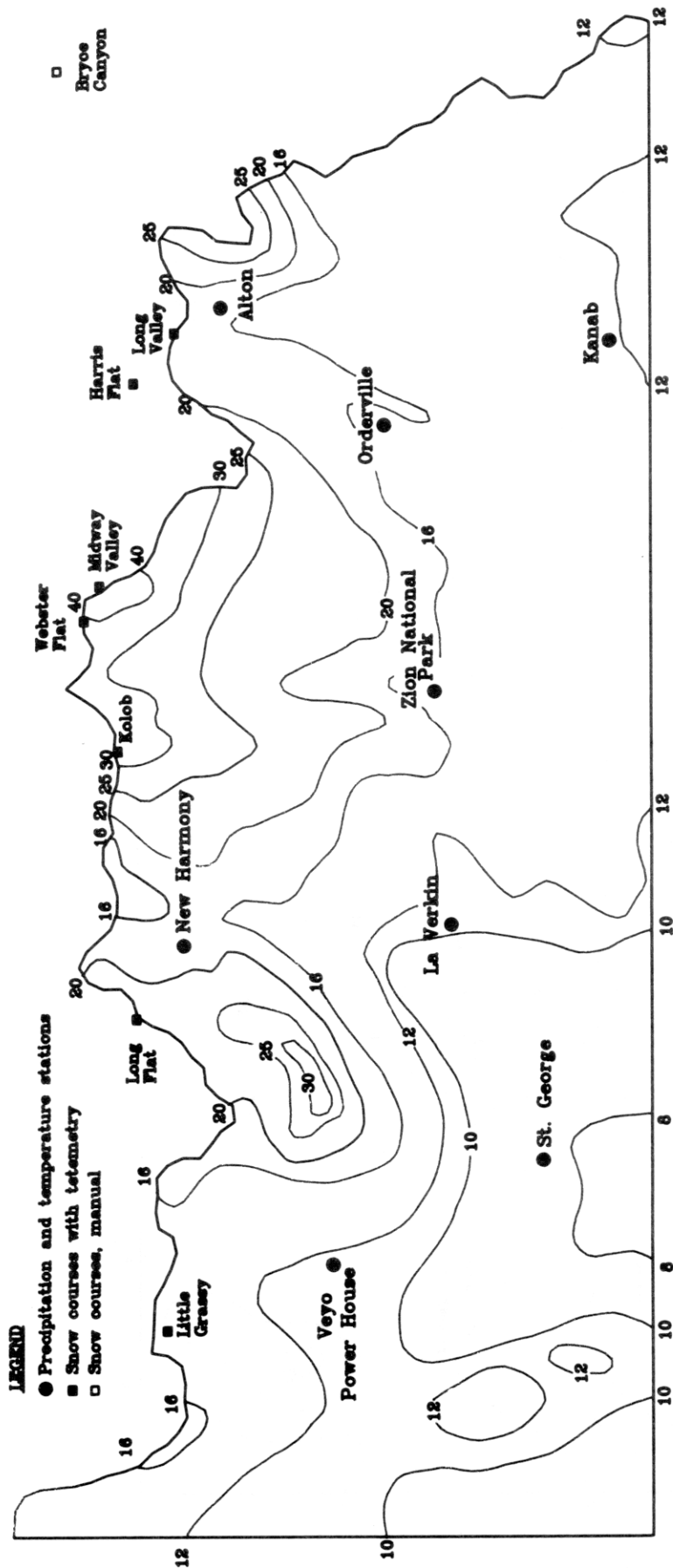
Azonal Areas - The influence of water table, flooding or some other factor are strong enough to over-ride climate as a controlling factor in some azonal sites.

### 3.3.3 Physiography and Geology

**Physiography** - The Lower Colorado River Basin below Lee Ferry and above Lake Mead is located in three states: Utah, Nevada, and Arizona (Figure 3-1). This interesting area is marked by mesas and



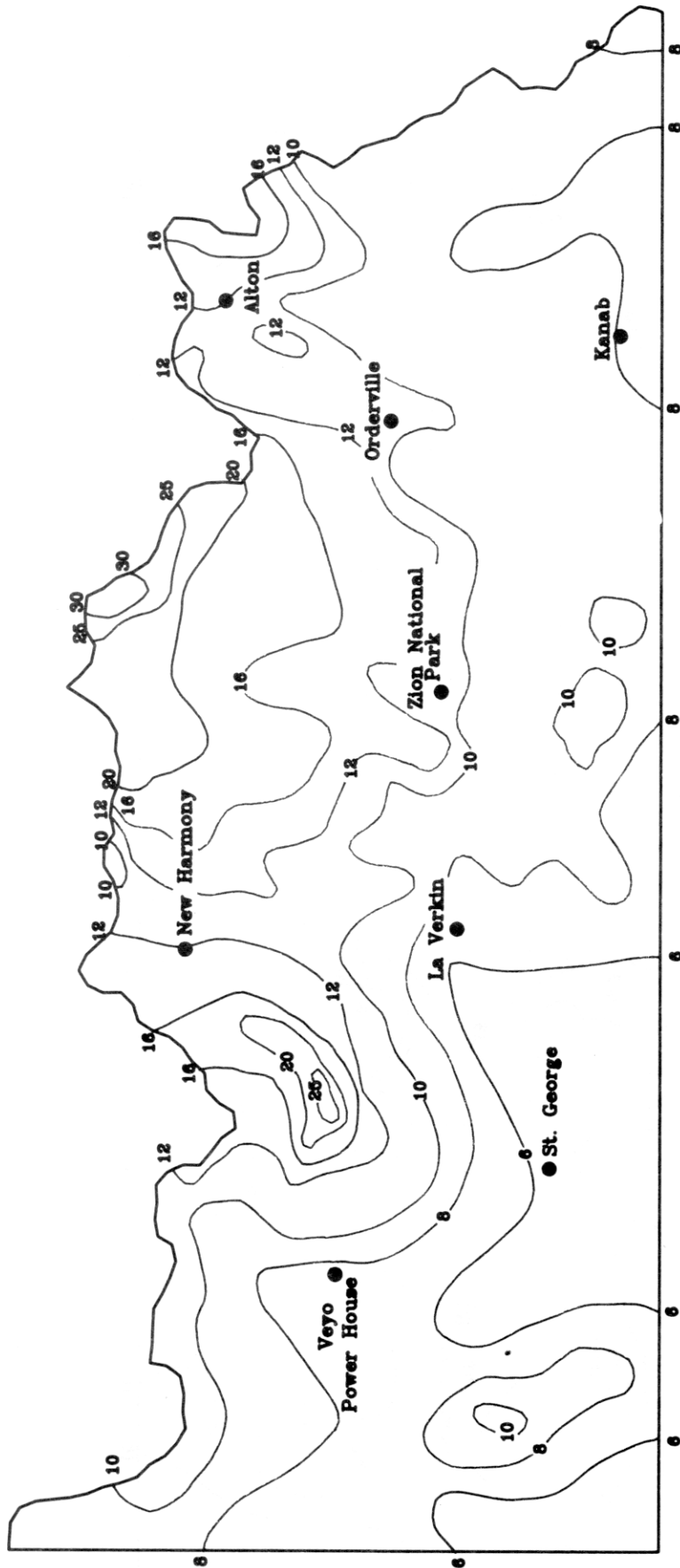
**FIGURE 3-3**  
**Climatological Reporting Stations and Normal Annual Precipitation**



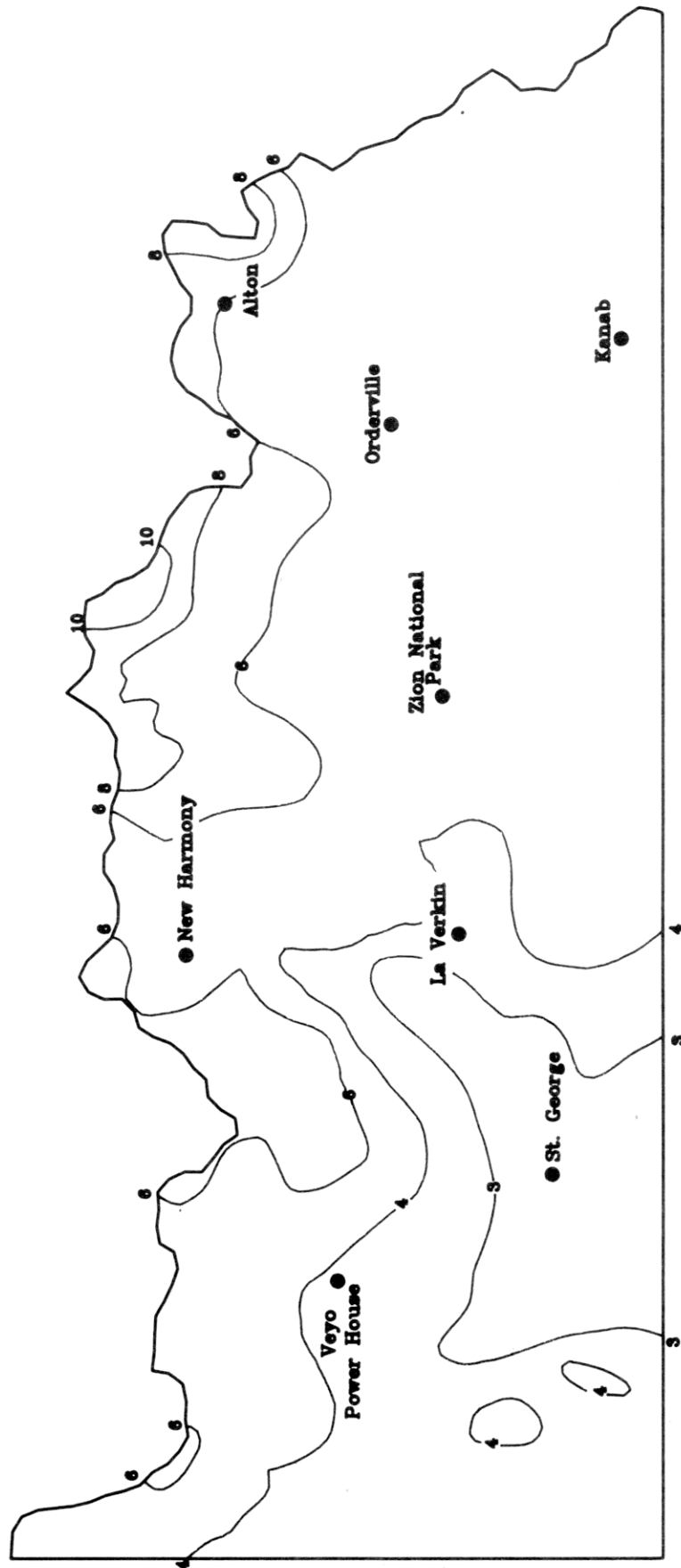
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**FIGURE 3-4**  
**Normal Precipitation, October Through April<sup>7</sup>**



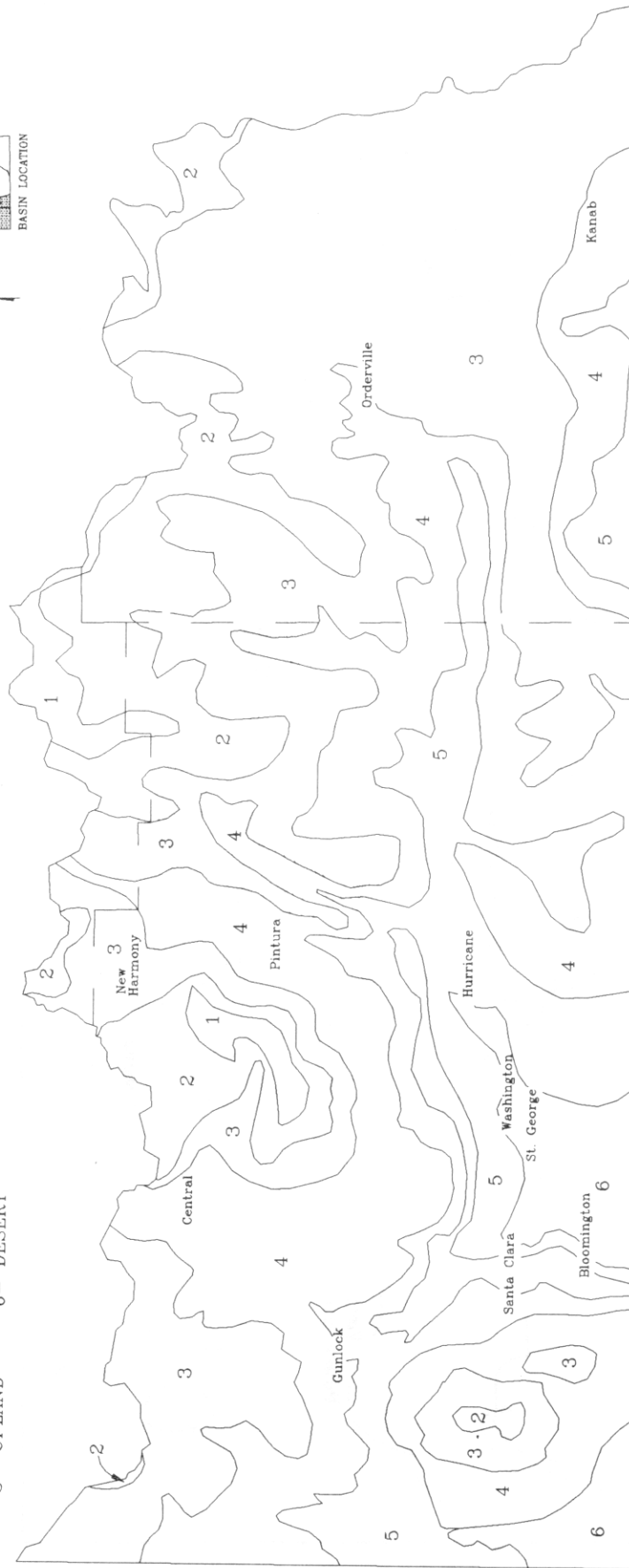
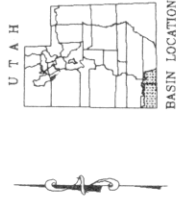
**FIGURE 3-5**  
**Normal Precipitation, May Through September<sup>7</sup>**



**FIGURE 3-6**  
**Climatic Zones**

**LEGEND**

- 1- HIGH MOUNTAIN
- 2- MOUNTAIN
- 3- UPLAND
- 4- SEMIDESERT
- 5- SEMIDESERT (D30)
- 6- DESERT



plateaus, escarpments, rugged peaks, broad flat-topped benches and basins. These all reflect the geology of the area.

The Utah portion (Kanab Creek/Virgin River Basin) is divided into two topographically different parts by the Hurricane Cliffs. The colorful mesas and plateaus of the Colorado Plateau Province rise to the east. Steep-walled narrow canyons and precipitous escarpments have been cut in the relatively soft sedimentary deposits by streams often carrying large volumes of abrasive sediments. The mesas and plateaus diminish in elevation to the south.

To the west of the Hurricane Cliffs, the landscape is more varied. St. George lies in a large valley, bounded on the north by the Pine Valley Mountains. Farther west, the Beaver Dam Mountains divide this basin from one stretching into Nevada. The northwest part of Washington County is marked by a jumble of low, irregular hills with only two or three prominent landmarks.

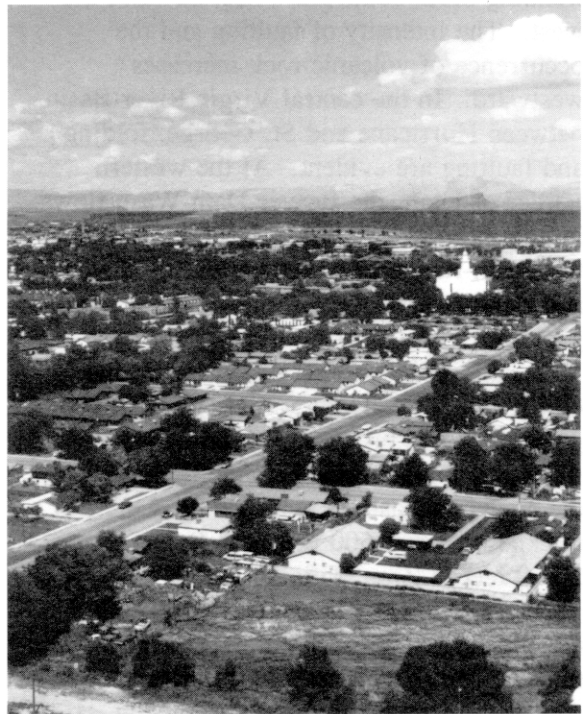
The eastern part of the basin is fed by drainages which head in the high plateaus above Johnson Wash and Kanab Creek. These rise on the escarpment of the Paunsaugunt Plateau and flow southerly before they join and empty into the Colorado River in northern Arizona.

The Virgin River flows southerly from the Markagunt Plateau, then turns west through Washington County. It then cuts across the northwest corner of Arizona before it empties into Lake Mead in Nevada.

The Santa Clara River originates on the north slopes of Pine Valley Mountains, flows west, then south to join the Virgin River near St. George. Beaver Dam Wash originates in Utah, flows southwest into Nevada, back into Utah, and joins the Virgin River in Arizona. The basin has been divided into watersheds to better identify

some of the resources and resources problems. These will be shown in the sections where they apply. The basin has nine watersheds (Figure 10-1).

**General Geology** - The area lies on what geologists call the "transition zone" between the Colorado Plateau Province and the Basin and Range Province. In the east, the underlying rock consists of relatively undeformed beds of sedimentary rock which dip gently toward the north. Over geologic time, the erosion of the north-dipping beds



by south-flowing drainage has created a series of cliffs formed by the exposed edges of the more resistant formations, called the "Grand Staircase." It is the combination of north dipping rock and south-sloping topography that gives the region its characteristic groundwater hydrology as well as its distinctive topography.

The rocks east of the Hurricane Cliffs consist of interbedded shales, siltstones and sandstones of Mesozoic age, and the freshwater limestones and volcanic rocks of Cenozoic age. West of the Hurricane Cliffs, a greater variety of rock is exposed including older sedimentary rock, crystalline rock of pre-cambrian age in the Beaver Dam Mountains and intrusive and extrusive volcanic rock of Tertiary age in and around the Pine Valley Mountains.

Tectonic deformation in the eastern portion consists of widely spaced faults trending north-south and offset down to the west. The intensity of faulting and the occurrence of volcanic rock increases westward. In the central Virgin River Basin, between Hurricane and St. George, folding and faulting are evident. At the western border of Utah, the Beaver Dam Wash flows in a fault-bounded alluvial basin typical of the Basin-Range Province valleys of Nevada and Arizona. Figure 3-7 shows the general geology.

**Aquifers**<sup>1,2,3,4</sup> - East of the Hurricane Cliffs, the alluvial valley fill is thin. Most groundwater is provided by bedrock sandstone units. Principal among these is the Navajo sandstone, which ranges in thickness from 1,500 feet near Kanab to 2,200 feet in Zion National Park.

West of the Hurricane Cliffs, unconsolidated alluvial valley fills are thicker, and they constitute significant aquifers. Alluvial aquifers are in New Harmony Valley, Pine Valley, Santa Clara River Valley and the basin of Beaver Dam Wash.

### 3.3.4 Soils, Vegetation and Land Use

Resource data on the soils and vegetation varies in accuracy, particularly across land ownership and management boundaries. More data is available in the Virgin River

drainage than in the Kanab Creek and Johnson Wash drainages.

**Soils**<sup>10,12</sup> - The basin has five broad, general landscapes. These landscapes can be used for interpretive purposes, and they are briefly described below. Each landscape generally has several soil associations. The soils in one association may occur in another, but in a different pattern. Other kinds of soil are present in each soil association, but they are not extensive enough to be included in the name.

Soil associations are useful to people who want a general idea of the soils in an area, who want to compare different parts of an area or who want to know about large tracts suitable for a certain kind of land use. The soils in any one association ordinarily differ in slope, depth, stoniness, drainage and other characteristics affecting management.

- Dominantly well-drained and somewhat excessively-drained, nearly level to steep, shallow to deep soils; on alluvial fans, flood plains, mesas and mountains.

Elevation ranges from 2,400 to 4,200 feet. Average annual precipitation ranges from six to 11 inches, average annual temperature ranges from 57° to 67° F and the frost-free period ranges from 190 to 205 days. The soils are used mainly for irrigated crops, range and wildlife habitat.

- Dominantly rock outcrop, rockland and badland and well-drained or somewhat excessively-drained, or

[illegible]

gently sloping to very steep, shallow and moderately deep soils in desert basins and on uplands.

Elevation ranges from 2,600 to 7,000 feet. The average annual precipitation ranges from eight to 14 inches, average annual temperature ranges from 52° to 59° F and the frost-free period ranges from 160 to 195 days. These soils are used mainly for aesthetic purposes, range and wildlife habitat.

- Dominantly well-drained to excessively-drained, nearly level to steep, shallow to deep soils; on alluvial fans, mesas, plateaus and valley bottoms.

Elevation ranges from 3,300 to 6,300 feet. Average annual precipitation ranges from 10 to 15 inches, average annual temperature ranges from 45° to 59° F and the frost-free period ranges from 120 to 170 days. The soils are used mainly for wildlife habitat, recreation, non-irrigated crops and range.

- Dominantly well-drained or somewhat excessively-drained, nearly level to very steep, shallow to deep soils; on mountains and fans.

Elevation ranges from 3,700 to 8,000 feet. Average annual precipitation ranges from 12 to 18 inches, average annual temperature ranges from 42° to 56° F and the frost-free period ranges from 70 to 170 days. These soils are used mainly for range, recreation and wildlife habitat.

- Dominantly well-drained to excessively-drained, gently sloping to very steep, shallow to deep soils; on alluvial fans, mesas, plateaus and mountains.

Elevation ranges from 3,500 to over 10,000 feet. Average annual precipitation varies from 12 to 40 inches, average annual temperature ranges from 35 to 55° F and the frost-free period ranges from 40 to 160 days. These soils are used mainly for watershed, wildlife habitat, range, recreation, esthetic purposes and some commercial forest products.

See Section 10, Agricultural Water Conservation and Development, for additional information on agricultural land use.

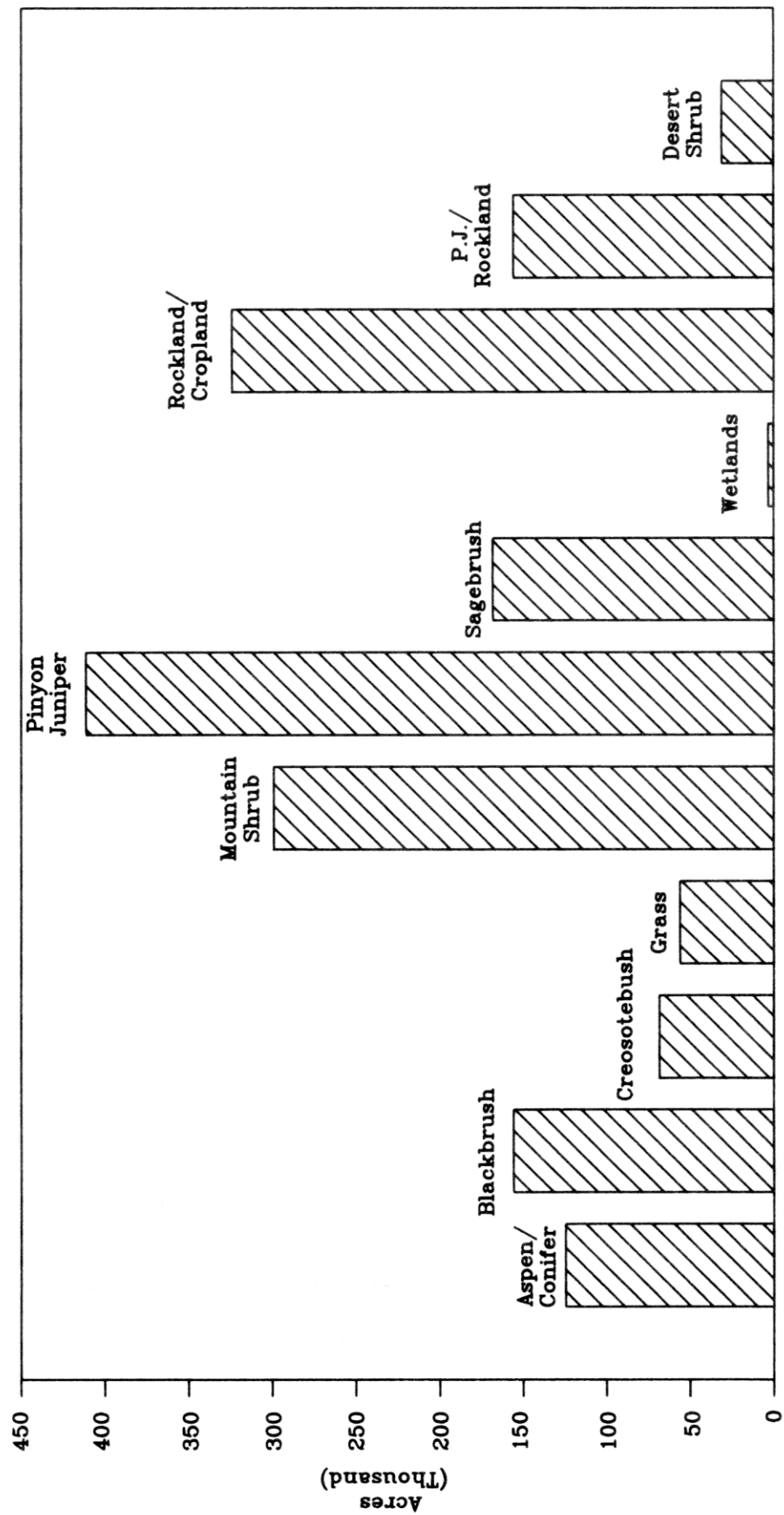
**Vegetation**<sup>10</sup> - Eleven landcover types have been categorized in the basin. Due to mapping intensities by various agencies, data detail will vary. Landcover data in the Virgin River drainage is adequate for the detail of this report. Information in the Kanab Creek and Johnson Wash drainages is still being collected and compiled.

The landcover types and areas of each for the Virgin River drainage are shown on Figure 3-8. These are broad delineations, shown to provide relative cover data.

Typically, the irrigated cropland areas are confined to the bottom lands along the stream channels. The bottom lands may also contain minor acreages of dry cropland but the non-irrigated areas are generally on the higher uplands where precipitation is greater. Cropland with the related agricultural types of land cover constitutes about 47,000 acres.

**Land Use** - The Soil Conservation Service capability groupings show, in a general way, the suitability of the soil for

**FIGURE 3-8**  
Landcover Types





most field crops. Soils are grouped according to their limitations and the way they respond to treatment.

The capability system groups soils at three levels: 1) capability class, 2) sub class and 3) unit. Capability classes, the broadest group, run from one to eight. The numbers indicate progressively greater limitations and narrower choices for practical uses for agricultural cultivation. Other uses, such as for wildlife, may not be as restrictive.

Class 1 - Has few limitations that restrict use.

Class 2 - Has moderate limitations that reduce the choices of plants or requires moderate conservation practices.

Class 3 - Has severe limitations that reduce the choices of plants and requires very special conservation practices.

Class 4 - Has very severe limitations that reduce the choices of plants and requires very careful management.

Class 5 - Is subject to little or no erosion but has other limitations impractical to remove, limiting the use to pasture, rangeland or other permanent vegetation.

Class 6 - Has severe limitations that make it generally unsuitable for cultivation and limit its use largely to pasture, rangeland and other permanent vegetation.

Class 7 - Has very severe limitations that makes it unsuitable for cultivation and limit its use largely to pasture and rangeland or for wildlife.

Class 8 - Soils and land forms have limitations that preclude the use for cropland and restrict its use to recreation, wildlife, habitat or watershed.

Capability subclasses are soil groups within one class. They are designated by adding a small letter e, w, s or c.

e - Limitations due to a risk of erosion by wind and/or water.

w - Water in or on the soil interferes with plant growth.

s - Limitations due to shallowness, low water holding capacity or stony.

c - Limitations due to climate, too cold or too dry.

The majority of the soils (about 90 percent) in the basin are capability classes 5 thru 7. These soils, with moderate to severe limitations, are used primarily for pasture and rangeland.

Lands used for farming can also be defined according to their agricultural production capability and potential. Two categories, prime farmlands and farmland, are of statewide importance. About 17,000 acres of prime farmland and 26,000 acres of farmland have statewide importance. See Section 10.4 for detailed descriptions.

About 25,600 acres of irrigated cropland are in the Kanab Creek/Virgin River drainage in Utah (See Table 10-4). About 3,000 acres in Arizona and 4,000 acres in Nevada are irrigated cropland.

The balance of the area in Utah is primarily used for rangeland, although some rockland areas are unsuitable for grazing. Grazing is also prohibited in Zion National Park. Rangeland condition by percent of area is shown in Table 3-1.

Forest resources are produced in many areas in addition to the grazing resource. Six different forest types are pinyon-juniper, gambel oak, mountain mahogany, aspen, fir/spruce and pine.

The intensive management of commercial timber stands is not emphasized in the basin. Some commercial stands of aspen and ponderosa pine are on rimlands. Steep, dissected side slopes of the watersheds have mixed conifer.

The majority of the aspen is on private land. The numerous landowners involved with this resource make it difficult for

TABLE 3-1 RANGELAND CONDITION	
Condition	Area (percent)
Good	15
Fair	45
Poor	15
Not Rated	25

harvesters to obtain sufficient quantities to justify sales. Much of the conifer timber is located on or near mountain cabin lots discouraging harvesting. The ponderosa pine resource is mostly on the rims close to Zion National Park making harvesting to any scale very difficult and environmentally sensitive.

About 50 percent of the forest type is pinyon-juniper. Some fire wood, fence posts and pinenuts are commercially harvested. Recent interest has been shown in harvesting sap from pinyon and using juniper for fire starter, perfume and deodorizing bases. Interest has been increasing in transporting firewood (pinyon-juniper and gambel oak) to Nevada and California.

### 3.3.5 Land Status

The total area of the Lower Colorado River Basin in Utah is about 2.2 million acres. The area of the major drainages and their tributaries is: Virgin River, 1.8 million acres; Kanab Creek, 189,000 acres and Johnson Wash, 211,000 acres. The total area of the Virgin River is about 3.2 million acres. Of this total, 1.8 million acres are in Utah, 1.1 million acres in Arizona and nearly 300,000 acres in Nevada.

The federal government has the responsibility to administer about 68 percent of the basin lands in Utah. The state administers about eight percent and

23 percent is privately owned lands. The breakdown of land ownership and administration is shown in Table 3-2.

The federally administered land is under the jurisdiction of three agencies, one in the Department of Agriculture and two in the Department of Interior. They are the Forest Service, Bureau of Land Management and the National Park Service. In addition, the Bureau of Indian Affairs works with the Indian tribal lands. Table 3-3 shows these jurisdictions. ■

TABLE 3-2  
LAND OWNERSHIP AND ADMINISTRATION

Status	Virgin River		Kanab Creek and Johnson Wash		Total	
	(acres)	(percent)	(acres)	(percent)	(acres)	(percent)
Private	433,500	23.7	80,800	20.2	514,300	23.0
Tribal	28,500	1.5	-0-	-0-	28,500	1.3
State	140,600	7.7	37,200	9.3	177,800	8.0
Federal	1,228,400	67.1	282,000	70.5	1,510,400	67.7
TOTAL	1,831,000	100.0	400,000	100.0	2,231,000	100.0

TABLE 3-3  
FEDERAL LAND ADMINISTRATION

Agency	Virgin River		Kanab Creek and Johnson Wash		Total	
	(acres)	(percent)	(acres)	(percent)	(acres)	(percent)
Forest Service	291,000	23.7	8,200	2.9	299,200	19.8
Bureau of Land Manag.	795,100	64.7	273,800	97.1	1,068,900	70.8
National Park Service	142,300	11.6	-0-	-0-	142,300	9.4
Total	1,228,400	100.0	282,000	100.0	1,510,400	100.0

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